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Department of Agriculture, C. P.

REPORT

ON THE

NAGPUR EXPERIMENTAL FARM

IN THE

CENTRAL PROVINCES,

FOR THE YEAR 1889-90,

Ending 31st March 1890.

NAGPUR:
PRINTED AT THE SECRETARIAT PRESS.

1890.

[PRICE—EIGHT ANNAS.]

6. Ensilage with juar and guinea grass again proved successful. The experiments showed that of the weight of green stuff put into the silo 67 per cent would be recovered in good condition as ensilage.

7. Three careful trials were made of the effect on wheat of green soiling with hemp. In two cases no increase was gained, whereas in the third case the increase was very considerable. The season was of course greatly against the success of this experiment, as rain is absolutely necessary in order to bring about the decay of the hemp and facilitate the assimilation of its nitrogen by the wheat crop.

8. In paragraph 16 of the Report, six years results are given for the two series of experimental plots which have been permanently set apart for the continuous growth of wheat with various manures. These plots are looked after with very great care; a sufficient period has elapsed since they were first set apart to eliminate differences owing to previous treatment, and their outturns should throw much light on the interesting question of the extent to which it pays to manure for wheat in these Provinces. The first point to be noted in the results is the extent to which the relative amounts of the outturns have fluctuated from year to year. Taking for instance the plots to which cattle dung is applied and the plot which receives no manure in the first series of plots the results are;—

Grain in lbs. per acre.

	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.
Cattle dung, 114 cwt. per acre ...	1,002	515	1,550	1,138	350	1,012
No manure ...	1,055	763	1,060	760	525	887

In two of the years the use of cattle dung actually resulted in a considerably less outturn; in a third year the difference was practically nothing; in the other three years the increase in outturn gained ranged from 125 to nearly 500 lbs. per acre, the latter figure representing a profit of about Rs. 14. The outturns given by the other manures exhibit similar fluctuations.

These results show very clearly the uncertainty of manuring for wheat. To exert an effect manure must of course become dissolved; in other words its effect is dependent on the amount of moisture in the soil. In years of good rainfall the use of manures will result in very large profits;—on the other hand, if the rainfall be scant the manure is useless, and may be even harmful by attracting white ants. During the year under report not a single manure repaid its cost. It is not extraordinary that in these Provinces the manuring of wheat land should be very rarely practised.

9. One obvious deduction to be drawn from these experiments is that the utility of manures might be enormously enhanced by irrigation, and in future years one of the series of plots will be irrigated. Irrigation has not been used hitherto on the Farm because it is so very rarely practised in these Provinces, and it has been considered advisable to restrict the experiments to the lines followed by local agriculture. During the year under report, however, water was applied to three small plots on which hand-picked wheat was sown and the results were very remarkable. The seed was hand dibbled at the rate of only 18 to 25 lbs. per acre. Three waterings were given—one before sowing and two to the growing crop in December and January. The outturns per acre amounted to 23 maunds, 24 maunds and 28 maunds respectively, worth from Rs. 64 to Rs. 82. The season was exceptionally favourable for irrigation, as owing to the absence of rain there was an entire absence of fungoid disease, which is commonly supposed to be the great hindrance to the irrigation of wheat on black soil. But experiments in irrigating manured crops of wheat will be regularly made in future.

10. The Agricultural Class attached to the Farm is now in a flourishing condition. The number of entries, which fell off last year, has now risen to our full requirements, a considerable number of the students coming from out districts and being boarded at the class. The results of the Final examination of

last March were on the whole very satisfactory. A copy of the Class Prospectus is attached to this Report. If it does nothing else, the Class will supply a great want of Government in these Provinces, viz : a number of trained candidates for employment in the Revenue and Court of Wards Departments.

11. The Comparative Abstract of Experiments appended to the report has been amplified by the addition of money columns for cost and outturn, and a table is added giving details of the rates from which the cost of cultivation has been calculated. These rates are based on the actual outlay of the year, and represent the cost of cultivating by hired labour in the vicinity of Nagpur. The charges are of course very much higher than those which affect the expenditure of an ordinary cultivator.

12. Mr. Mahalaxmiwala has been in charge of the Farm throughout the year. He is also Principal of the Agricultural Class, and the success which that institution promises to attain is mainly due to his industry and abilities. He has shown powers of control as well as of teaching, and the discipline maintained in the Class is one of its best features.

I have the honour to be,

Sir,

Your most obedient Servant,

J. B. FULLER,

Commissioner of Settlements and Agriculture,

Central Provinces.

SUBJECT. Report on the Experimental Farm, Nagpur, for the year 1889-90.

FROM

THE SUPERINTENDENT,

EXPERIMENTAL FARM,

Nagpur,

To

J. B. FULLER, ESQ., C. S.,

COMMISSIONER OF SETTLEMENTS AND AGRICULTURE,

Central Provinces.

Dated Nagpur, the 14th July 1890.

SIR,

I have the honour to submit the annual Report on the working of the Nagpur Experimental Farm during the year ending the 31st March 1890.

A.—SEASON.

2. It will be seen from the table below, that the rain-fall of the year, fell short of the average of 15 years preceding by 10·07 inches:—

Month.		Year under report.		Average of 15 years preceding.	Month.		Year under report.		Average of 15 years preceding.
		Rainy days.	Inches.				Rainy days.	Inches.	
April ...	1st half	...	...	0·12	October ...	1st half	6	1·23	1·74
	2nd half	2	1·19	0·20		2nd half	4	2·77	1·43
May ...	1st half	...	...	0·33	November..	1st half	...	...	0·59
	2nd half	2	0·06	0·31		2nd half	...	...	0·20
June ...	1st half	4	0·56	3·52	December...	1st half	...	...	0·13
	2nd half	6	6·54	5·03		2nd half	...	...	0·36
July ...	1st half	8	4·48	7·84	January ...	1st half	...	...	0·44
	2nd half	10	2·59	7·11		2nd half	...	...	0·16
August ...	1st half	13	9·34	6·83	February...	1st half	...	...	0·11
	2nd half	13	4·92	4·17		2nd half	...	...	0·27
September..	1st half	9	2·60	4·44	March ...	1st half	2	0·25	0·07
	2nd half	5	3·03	3·88		2nd half	1	0·01	0·27
					Grand total ..		85	39·57	49·64

The character of the season was very favourable to cotton, and other kharif crops, the rain-fall being even and seasonable. But the heavy rain in the second half of October slightly damaged the crops and reduced the yield of cotton from what promised to be a bumper harvest. The rabi crops were sown in favourable weather, and though the heavy fall of rain

in the second half of October necessitated some resowings, it was on the whole beneficial to both wheat and linseed. The year under report, like the preceding one, was characterized by the entire absence of the usual cold weather rains. This together with the prevalence of winds in January and February reduced the yield of the rabi crops a good deal.

B.—Field Experiments.

(a).—*Kharif crops.*

3. Three fields in which a crop of green hemp had been ploughed in during the previous years were sown with Upland Georgian cotton, and the results bear out those obtained last year in showing that green soiling has a favourable effect on a cotton crop. The outturns were as follows :—

No. of field.	Area of field.	Treatment in previous year.		Special treatment in year under report.	Outturn of cleaned cotton per acre.
		Manure.	Crop.		
	Acres.				lbs.
61	1·05	Hemp.	Linseed.	Nil.	101
63	1·02	do.	Wheat.	do.	82·5
65	0·93	do.	do.	do.	66

The produce of a neighbouring cotton field (No. 53) which was unmanured in both years was 63 lbs. per acre, and there is no reason to think that these fields would have given a larger outturn than this had hemp not been used.

4. Trials were made in the case of two of the above fields of preparing cotton seed for sowing with sulphuric acid, as against the country method of preparing it with dung, and in both cases the sulphuric acid treatment gave better results, as is shown below :—

Serial number of experiment.	No. of field.	Area of field.	Treatment in previous year.		Special treatment in year under report.	Outturn per acre of cleaned cotton.
			Manure.	Crop.		
		Acres.				lbs.
1	61E	0·52	Hemp.	Linseed.	Seed prepared with dung.	89
	61W	0·53	do.	do.	Seed prepared with acid.	113
2	63E	0·51	Hemp.	Wheat.	Seed prepared with dung.	65
	63W	0·51	do.	do.	Seed prepared with acid.	100

Two sets of similar experiments in 1886-87 gave 116 lbs. and 177 lbs. of cleaned cotton per acre from seed treated with sulphuric acid against 84·5 lbs. and 203·5 lbs., respectively, from seed prepared in the ordinary way. The results of the first pair were considered to be the most reliable, as the plots were quite similar and had received the same previous treatment.

The use of sulphuric acid to prepare cotton seed for sowing was (it appears) first suggested by the Microscopist to the Department of Agriculture, United States of America. The process is described by him as follows :—

To one pound of cotton seed add about two ounces of strong sulphuric acid of commerce, mixing the mass intimately with a stick. Should the mass appear wet, more seed should be added. The acid should be dried up by the seed, care being taken that every seed is made moist with acid. In a few minutes the lint will be converted into a paste which is quite soluble in water. Wash the seed now in a clear solution of lime-water, in which the light and worthless seeds will float to the surface, while the plump and sound ones will sink to the bottom. After removing the floating seeds the sound ones should be washed in pure water, the washings being saved for fertilizing purposes. About one-sixth of water may, at the outset, be added to the sulphuric acid. The object in using strong acid is to remove the lint more quickly. When water is mixed with sulphuric acid the mixture heats, and for the purpose desired it should be allowed to cool before adding the cotton seed. The vessel used should be acid proof, as a stone or glass basin, or a wooden box lined with sheet lead. Tin or iron will not answer. Seeds thus treated should be kept in a dry place. Seeds planted eight months after treatment have grown well.

The cost of 2 lbs. of commercial acid required for 16 lbs. of cotton seed (the maximum quantity sown per acre) is 12 annas.

5. The results of the following experiments give a comparative view of the effects of dung, poudrette, hemp and bone dust on cotton during the season under report :—

Serial number of experiment.	No. of field.	Area of field.	Treatment in previous year.		Special treatment in year under report.	Outturn per acre of cleaned cotton.
			Manure.	Crop.		
		Acres.				
1	18E	0·44	Dung.	Cotton.	Dung 160 maunds ...	101
	18W	0·44	Bone dust.	do.	Bone dust 360 lbs. ...	79
2	39S	0·37	Dung.	Linseed.	Dung 160 maunds ...	175
	39N	0·21	Bone dust.	do.	Bone dust 360 lbs. ...	84
3	17	0·49	Dung.	Wheat.	Dung 160 maunds ...	144
	21	0·76	Hemp.	do.	*Nil.* ...	121
	25	0·48	Bone dust.	do.	Bone dust 360 lbs ...	93
4	53	1·61	*Nil.*	Wheat.	*Nil* ...	63
	55	1·53	Dung.	do.	Dung 160 maunds ...	112
	57	1·25	Bone dust.	do.	Bone dust 360 lbs ...	68
	59E	0·85	*Nil.*	Cotton.	Poudrette 200 maunds...	86
	59W	0·85	Poudrette.	do.	*Nil* ...	80
5	40	0·30	*Nil.*	Linseed.	*Nil* ...	141
6	Irri : 2	0·10	Gypsum (western half.)	Wheat.	Dung 160 maunds ...	160

The results of experiment No. 3 indicate the effect of hemp a year after it was ploughed in. Dung in all cases has as usual given the best outturn, and poudrette applied this year and in the previous year has in both cases shown good results. It will be noticed that fresh applied poudrette, has given almost the same outturn as the previous year's application. The result of previous years' experiments have been verified in the case of bone-dust, which yielded much less than dung, hemp or poudrette. In experiment No. 5, field No. 40 has been unmanured since 1883-84 when it received poudrette. It has since that year borne remarkably well and shows that the effect of poudrette continues over as many as six years. But it should be observed that the field is naturally a good one.

All the above fields with the exception of the last one (No. Irri. 2) were sown with Upland Georgian cotton. Field No. Irri. 2 was sown with Hinganghat bani cotton and has given a very good outturn. Trials will be made next year with different varieties of cotton, both indigenous and exotic, to ascertain their comparative outturn.

6. A small area was sown with four varieties of imported Sea Island cotton, but they did not produce more than about 10 lbs. in all.

7. At the request of Mr. Venkatesh Govind Karmarkar one khandi of Upland Georgian cotton seed was sent to him for trial at Wardha, and 700 lbs. of seed were distributed to cultivators in Wardha through the Manager, Empress Mills, Nagpur. The latter has informed me that most of the cultivators had mixed up the seed with the indigenous varieties, and hence no reliable information could be had as to its yield, quality, &c.

8. Series B of the permanent experimental plots was sown this year again with til. The results are compared below with those obtained on the same set of plots during the preceding year :—

Number of plot.	Manure and rate per acre.	Outturn of seed per acre.		Increase per cent on produce of unmanured plot.	
		1888-89.	1889-90.	1888-89.	1889-90.
		lbs.	lbs.		
I	Saltpetre 240 lbs. ...	790	397	+ 79	+41
II	Bone dust 360 lbs. ...	880	275	+100	— 2
III	Saltpetre 240 lbs. and bone dust 360 lbs. ...	640	490	+ 45	+74
IV	Cattle dung 160 maunds ...	560	407	+ 27	+44
V	Cattle dung 160 maunds and bone dust 360 lbs. ...	670	290	+ 52	+ 3
VI	Ashes of 160 maunds dung ...	520	245	+ 18	—13
VII	No manure ...	440	282	...	...

The results are very discrepant and merely illustrate the difficulty of obtaining accurate results in experiments with manures made during the monsoon season, when small differences in surface level are sufficient to obscure the effect of any manures which can be supplied.

9. Sorgho was grown for sugar making on two fields, one half of each field being manured with dung and bone dust, respectively, the other half being left unmanured. The results were as follows :—

Number of field.	Area of field.	Manure and rate per acre.	Outturn per acre.			
			Canes.	Juice.	Syrup.	Sugar.
	Acres.		lbs.	lbs.	lbs.	Oz.
67 E. E.	0·32	Dung 160 maunds ...	3,424	1,912	274	8
67 E.W.	0·37	... ...	3,392	1,932	237	6·5
69 E.	0·30	... ...	1,701	919	124	2
69 W.	0·29	Bone dust 360 lbs. ...	2,443	1,309	147	3·5

It will be observed that dung added only one per cent to the weight of the canes, but over 15 per cent to the weight of the syrup. Bone dust added 43 per cent to the weight of the canes and 18 per cent to the weight of the syrup. As usual the amount of crystallized sugar gained from the sorgho syrup was exceedingly small.

10. The table below shows the average outturn per acre of the other kharif crops :—

Crops.		Area 1889-90.	Kind.	Outturn per acre.	
				Average of past four years 1886 to 1889.	1889-90.
		Acres.		lbs.	lbs.
Juar (Holcus Sorghum) for grain	...	3·29	Grain... Stalks...	471 3,252	575 2,888
Juar (do.) for fodder	...	4·96	Fodder..	4,006	4,187
Guinea grass (Panicum jumentorum)	...	1·49	do.	1,077	923
Tur (Cajanus flavus)	...	6·26	Grain...	680	616
Mung (Phaseolus mungo)	...	0·13	do.	213	223
Urd (Phaseolus radiatus)	...	1·06	do.	...	33
Popat white (Lablab vulgaris)	...	2·08	do.	342	184
Japan pea (Glycine hispida)	...	0·55	do.	88	87
Country pea (Pisum sativum)	...	0·08	do.	...	1,391
Til (Sesamum indicum)	...	0·67	do.	218	228
Castor (Ricinus communis)	...	1·20	do.	308	328
Chillies (Capsicum annuum)	...	0·07	Dry chillies.	218	86

Many of these outturns are very low. But a considerable proportion of the Farm area is of much below average fertility, being of sloping surface and with soil deteriorated by the admixture of particles of gneiss.

11. Ensilage experiments were made with green juar stalks cut while in flower, and guinea grass. The dimensions of the juar silo were $15\frac{1}{2}' \times 13\frac{3}{4}' \times 5'$. Filling was commenced on the 16th October and was not finished till the 8th November, as there was rain in the interval and the work had to be stopped in consequence. 14,561 lbs. were altogether put in. It was covered over with a layer of earth 4′ in depth. The silo was opened on the 5th April 1890, and 9,800 lbs. of good sweet silage were taken out. The portion spoiled at the sides and top was 784 lbs. The other silo was $11\frac{1}{2}' \times 9\frac{1}{4}' \times 5\frac{5}{6}'$. It was filled partly with guinea grass and partly with juar stalks. 4,773 lbs. of guinea grass were put in, and over that 2,790 lbs. of juar stalks. The filling of the silo occupied 8 days from 30th October to 6th November. It was opened on the 28th April 1890, when 2,744 lbs. of good guinea grass and 1,008 lbs. of juar silage were taken out. The cost of making the pits, cutting the crops, carriage, filling and covering was at the rate of two and half annas per maund of good silage.

(*b*).—*Rabi crops.*

12. *Embanking.*—The results of the trials which have been made in embanking fields for wheat crops have not been encouraging. This is without doubt due in great part to the fact that the Farm soil is not altogether well suited for embanking, being too light and friable, owing partly to surface scouring in the past, and partly to its containing an admixture of particles of gneiss. But enquiries which have been made in the Jabalpur district (where the embankment of fields is very largely practised) indicate that a mistake has been made in the method of cultivation, as the fields have been bullock-hoed (bakhared) before sowing, whereas in the Jabalpur district they are sown without any preliminary tillage. Unfortunately this error was not discovered until after the crops under report had been sown.

13. The table below shows the yield of embanked fields :—

Serial number of experiment.	Number of field.	Area of field.	Crop.	Special treatment.	Outturn of grain per acre.	Remarks.
		Acres.			lbs.	
1	34	1·22	Linseed. ...	*Nil.* ...	188	
2	41	1·22	Wheat (haura)	Dung 160 mds. (before rains). ...	258	
	43	1·30	do.	do. (after rains) ...	262	
3	62 E.	0·81	do.	Saltpetre 240 lbs. ...	246	
	62 W.	0·81	do.	*Nil.* ...	125	
4	64 W.	0·63	do. (pissi).	Saltpetre 240 lbs. ...	232	
	64 E.	0·63	do.	*Nil.* ...	121	
5	45	1·21	do. (katha).	do. ...	272	

The outturns are in all cases miserably poor. A trial was made to ascertain whether any difference would result were dung applied after the rains instead of in June as usual. No difference to speak of resulted.

14. *Green soiling.*—The following experiments in green soiling were made.

Serial number of experiment.	Number of field.	Area of field.	Treatment in preceding year.		Treatment in year under report.		Outturn of grain per acre.	Remarks.
			Manure.	Crop.	Manure.	Crop.		
		Acres.					lbs.	
1	46	1·10	Hemp.	Wheat.	Hemp	Linseed.	208	Not intended for experiment and no plot for comparison.
2	22	1·19	*Nil.*	Juar.	Hemp.	Linseed.	421	These four fields 22, 23, 15 and 19 adjoin one another and their results may be fairly compared.
	23W	0·69	do.	Wheat.	*Nil.*	do.	310	
3	15	0·54	*Nil.*	Juar.	Hemp.	Wheat. (haura)	414	
	19	0·56	do.	Cape oats	*Nil.*	do.	142	
4	14E	0·51	*Nil.*	Cotton.	Hemp.	Wheat. (haura)	437	Strictly comparable.
	14W	0·51	do.	do.	*Nil.*	do.	443	
5	37	0·89	Hemp.	Linseed.	Hemp.	Wheat.	265	Not intended for experiment and no plot for comparison,
6	38N	0·15	...	Cotton,	Hemp.	Wheat. (pissi).	538	Strictly comparable.
	38S	0·15	...	do.	*Nil.*	do.	541	

Hemp made no difference in the case of the two wheat crops, in experiments 4 and 6 (which are the most reliable of the number), but it has improved the outturn of linseed considerably.

15 The results of other experiments with different kinds of commonly available manures are shown below:—

Serial number of experiment.	Number of field.	Area of field.	Treatment in preceding year.		Treatment in year under report.		Outturn of grain per acre.	Remarks.
			Manure.	Crop.	Manure.	Crop.		
		Acres.					lbs.	
1	46	1·10	Hemp ...	Wheat ...	Hemp ...	Linseed.	208	Both are very poor fields.
	47	1·44	*Nil* ...	do. ...	Bone dust...	do. ...	195	
2	23E	0·69	Bone dust...	Wheat ...	Bone dust..	Linseed.	322	The results are strictly comparable.
	23W	0·69	...	do. ...	*Nil* ...	do. ...	310	
3	60W	1·15	Bone dust...	Linseed.	Gypsum ...	Wheat ... (haura)	235	Do.
	60E	1·15	do. ...	do. ...	*Nil* ...	do. ...	245	
4	29	0·82	Dung ...	Cotton...	Dung ...	Wheat.	981	These three fields are adjacent, but the results given by the two portions of No. 33 are alone *strictly* comparable.
	33E	0·37	*Nil* ...	do. ...	*Nil* ...	do.	599	
	33W	0·37	Bone dust...	do. ...	Bone dust..	do.	639	
	36	0·55	*Nil* ...	do. ...	*Nil* ...	do.	719	
5	13	0·18	do. ...	Wheat ...	Gypsum ...	Wheat (pissi)	125	The two fields are adjacent, but No. 13 is of poorer quality than No. 12.
	12N	0·28	do. ...	do. ...	*Nil* ...	do. (katha)	302	
	12S	0·29	Bone dust...	do. ...	Bone dust...	do.	383	

In experiments 1 and 2 bone dust gave no appreciable increase. In experiments 4 and 5 it gave increases of 6 and 26 per cent respectively. Gypsum has been of no benefit. It may be remarked that fields Nos. 29, 33 and 36 are amongst the best in the Farm

16. Series A and C of the permanent experimental plots were sown as usual with haura wheat. The results, which are shown in the three following tables, differ in no marked degree from those of previous years.

TABLE I.—Series A.

Number of plot	Manure applied with details of rate per acre.	Outturn of grain per acre.						Outturn of straw per acre.						Average outturn per acre.		Percentage of increase over produce of unmanured plot.			
																Grain.		Straw.	
		1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	Grain.	Straw.	1889-90.	Average of 6 years.	1889-90.	Average of 5 years.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.				
I	Saltpetre, 240 lbs. ...	1,555	990	1,610	1,470	610	987	Not recorded.	2,440	2,360	1,640	770	1,347	1,204	1,711	+11	+42	—13	+32
II	Bone-dust, 360 lbs. ...	1,067	635	1,340	948	695	845		2,000	1,830	990	880	1,240	922	1,388	—5	+9	—20	+7
III	Saltpetre, 240 lbs. and bone-dust, 360 lbs	1,320	653	1,580	1,565	545	1,127		2,210	2,450	1,770	655	1,672	1,132	1,751	+27	+34	+7	+35
IV	Cattle dung, 160 mds. ..	1,003	515	1,550	1,138	350	1,012		1,740	2,390	1,260	490	1,720	928	1,520	+14	+10	+10	+17
V	Cattle dung, 160 mds., bone-dust, 360 lbs. ...	1,122	928	1,400	1,065	405	967		1,800	1,890	1,220	450	1,715	981	1,415	+9	+16	+10	+9
VI	Ashes of 160 mds. dung ...	1,394	855	1,350	830	600	1,110		2,250	2,120	1,060	930	1,632	1,023	1,598	+25	+21	+4	+23
VII	No manure ...	1,055	763	1,060	760	525	887		1,600	1,720	960	650	1,557	842	1,297	...	...	...	...
VIII	Crop of hemp ploughed in green ...	940	250	1,430	803	275	767		1,220	1,740	960	350	1,415	744	1,137	—14	—12	—9	—12

TABLE II.—SERIES C.

Number of plot.	Manure applied with details of rate per acre.	Outturn of grain per acre.						Outturn of straw per acre.						Average outturn per acre.		Percentage of increase over produce of unmanured plot.			
																Grain.		Straw.	
		1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	Grain.	Straw.	1889-90.	Average of 6 years.	1889-90.	Average of 5 years.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.				
I	Saltpetre, 240 lbs. ...	1,035	853	1,120	1,120	460	772	Not recorded.	1,610	1,610	1,260	570	1,077	893	1,225	+12	+44	— 3	+26
II	Bone-dust, 360 lbs. ...	942	1,023	1,120	855	375	752		1,660	1,660	960	570	1,147	844	1,199	+ 9	+36	+ 3	+23
III	Saltpetre, 240 lbs. and bone-dust, 360 lbs.	892	700	1,140	1,218	320	747		1,720	1,600	1,340	425	1,325	836	1,282	+ 9	+34	+19	+32
IV	Cattle dung, 160 maunds...	700	915	990	710	135	512		1,740	1,370	860	200	820	660	998	—25	+ 6	—26	+ 2
V	Cattle dung, 160 mds. and bone-dust, 360 lbs.	720	723	940	820	395	817		1,180	1,330	890	630	1,397	736	1,085	+19	+18	+26	+11
VI	Ashes of 160 mds. dung ...	939	848	970	853	385	767		1,460	1,330	880	450	1,007	794	1,025	+12	+28	— 9	+ 5
VII	No manure ...	640	700	780	733	195	687		1,470	1,200	820	270	1,112	622	974	...	...	...	...
VIII	Crop of hemp ploughed in green.	915	228	1,208	893	255	582		990	1,643	960	410	970	680	995	—15	+ 9	—13	+ 2

TABLE III.—Average of Series A. and C.

Number of plot.	Manure applied with details of rate per acre.	Outturn of grain per acre.						Outturn of straw per acre.						Average outturn per acre.		Percentage of increase over produce of unmanured plot.			
																Grain.		Straw.	
		1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	Grain.	Straw.	1889-90.	Average of 6 years.	1889-90.	Average of 5 years.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.				
I	Saltpetre, 240 lbs. ...	1,295	922	1,365	1,295	535	879	Not recorded.	2,025	1,985	1,450	670	1,212	1,048	1,468	+12	+43	— 9	+32
II	Bone-dust, 360 lbs. ...	1,005	829	1,230	901	535	798		1,830	1,745	975	725	1,193	833	1,294	+ 1	+14	—11	+17
III	Saltpetre, 240 lbs. and bone-dust, 360 lbs.	1,106	677	1,360	1,391	432	937		1,965	2,025	1,555	540	1,496	984	1,516	+19	+34	+12	+37
IV	Cattle dung, 160 maunds ...	852	715	1,270	924	242	762		1,740	1,880	1,060	345	1,270	794	1,259	— 3	+ 8	— 5	+14
V	Cattle dung, 160 maunds, and bone-dust, 360 lbs.	921	826	1,170	942	400	892		1,490	1,610	1,055	540	1,556	858	1,250	+13	+17	+17	+13
VI	Ashes of 160 maunds dung ...	1,167	852	1,160	841	492	938		1,855	1,725	970	690	1,319	908	1,312	+19	+24	— 1	+18
VII	No manure ...	849	732	920	746	360	787		1,400	1,460	890	460	1,334	732	1,109	...	...	...	...
VIII	Crop of hemp, ploughed in green ...	928	239	1,319	848	265	674		1,105	1,692	960	380	1,192	712	1,066	—14	+ 3	—11	— 4

17. In previous years experiments have been made with mixed chemical manures on the lines recommended by M. George Ville on plots which were intended to be permanently appropriated to this purpose. Experience has shown, however, that the plots differed in natural fertility, and arrangements have been made to institute a fresh series of trials elsewhere.

18. The table below shows the outturn of pedigree wheat. The seed was selected from last year's pedigree crop. The largest and well-filled ears were first selected and kept unthreshed till the sowing time. At sowing time the ears were threshed by hand and the grains passed through a separator. From the cleaned grains the largest and plumpest were selected for seed. The fields were first manured with bone dust at the rate of 360 lbs. per acre. Furrows were then made with the *nars* plough 6 inches apart and the field irrigated on the 8th November 1889. Five days later the seed was dibbled by hand in the rows; 23 lbs. of pissi, 18 lbs. of haura and 25 lbs. of katha seed were dibbled per acre. After germination the plants were thinned out to from 2 to 3 inches apart. The crop was weeded once by hand and another watering given on the 27th December 1889. When the ears had set, a third watering was given on the 31st January 1890.

Variety.	Area.	Outturn per acre.		Cost of cultivation.	Value of produce.	Remarks.
		Grain.	Straw.			
	Acres.	lbs.	lbs.	Rs. a. p.	Rs. a. p.	
Haura (hard white Nagpur) ...	0·09	2,272	6,378	31 7 10	82 3 4	
Pissi (soft white) ...	0·09	1,983	5,700	31 9 11	70 14 6	
Katha (hard red) ...	0·09	1,844	5,444	31 10 2	64 1 7	

The outturn is very remarkable and shows what selection of seed and irrigation can do for wheat in these Provinces. The net profit in the case of haura is about Rs. 50 per acre and in the case of pissi and katha Rs. 39 and Rs. 32 respectively. The pedigree wheat was heavier and was valued in the market at a higher rate than the ordinary farm wheat, as will be seen from the table which follows :—

	Average weight of one paili.		Market value of one khandi of	
	Pedigree wheat.	Ordinary wheat.	Pedigree wheat.	Ordinary wheat.
	lbs. oz.	lbs. oz.	Rs. a. p.	Rs. a. p.
Haura	2 10¾	2 9¾	12 4 0	11 14 0
Pissi	2 10¾	2 9¾	12 0 0	11 8 0
Katha	2 10¾	2 10	11 8 0	11 4 0

19. The carbon bisulphide experiment for the prevention of weevil attacks was continued with almost the same results as in the previous year, as will be seen from the table below :—

No. of dhola.	Quantity of wheat stored.	Treatment.	When stored.	When opened.	Result.	
					1888-89.	1889-90.
	Mds.					
1	2½	Treated with bisulphide of carbon.	10 4 89	Opened twice during the rains.	18 per cent weeviled.	9 per cent weeviled.
2	2½	*Nil.*	Do.	Do.	25 do.	10 do.
3	2½	Treated with bisulphide of carbon.	Do.	Not opened till October.	12 do.	6 do.
4	2½	*Nil.*	Do.	Do.	16 do.	7 do.

The grain was stored in last year's dholas and it was noticed that the grain was attacked with weevils in a lesser degree than in the preceding year, the effect probably of last year's treatment.

20. The average outturn of rabi crops is compared below with that of preceding years:—

Crop.	Average outturn per acre in					Area.	Outturn of grain per acre.			Remarks.
	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.	Maximum.	Minimum.	Average.	
	lbs.	lbs.	lbs.	lbs.	lbs.	Acres.	lbs.	lbs.	lbs.	
Wheat (hard red) ...	...	469	615	407	162	2·02	594	272	330	
Do. (soft white) ...	379	426	423	546	70	1·74	541	121	234	
Do. (Nagpur haura)	580	454	589	466	191	18·44	1,450	92	381	Including manure plots.
	422	409	520	389	165	16·54	981	92	321	Excluding manure plots.
Linseed ...	215	166	188	161	238	10·61	421	139	256	
Gram ...	185	257	197	264	434	6·11	442	85	160	

The above table in connection with the one given below showing the rainfall from September to March of the years from 1884-85 to 1889-90, brings out clearly the effect of climate upon the crops.—

	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.	1889-90.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
September ...	14·21	3·57	4·69	8·64	5·75	5·63
October and first-half of November ...	0·71	1·61	10·69	6·62	0·61	4·00
Second-half of November and from December to March ...	4·65	4·83	0·63	2·38	0·79	0·26
Compare average outturn of —wheat (haura) ...	580	454	589	466	191	381
—linseed ...	215	166	188	161	238	256

A copious rain-fall at sowing time (October and 1st half of November) is very beneficial to wheat, but is unsuited for linseed, as exemplified in the years 1886-87 and 1887-88. A deficient rain-fall at sowing time is sometimes, as in the year 1884-85, compensated for by a very heavy fall in the previous month (September). That absence of much cold weather rain (2nd half of November to March) is beneficial than otherwise to linseed is clearly seen from its outturn in 1888-89 and 1889-90. The small yield of linseed in 1886-87 was the result of very heavy rain in October soon after sowing, and not to the deficiency of cold weather rains. Wheat on the contrary is much benefitted by the cold weather showers, as in the years 1884-85, 1885-86 and 1887-88. That the deficiency of the cold weather rain did not affect the outturn of wheat in 1886-87 was owing to the extraordinary fall of about 11 inches in October and the 1st half of November.

Cloudy weather in December and January affects both crops, but especially linseed, injuriously, as was the case in 1885-86 and 1887-88.

Gram has been sown on the Farm in some years in very bad fields and in others in good fields, so that no reliable conclusions regarding the effects of climate can be drawn from its outturn.

21. This year's sugar-cane was again altogether damaged by white ants. An Australian specific for white ants as well as assafœtida and salt were tried, but without any effect. For the purpose of demonstrating sugar manufacture to the students of the Agricultural Class half an acre of sugar-cane crop was bought from one of the tenants of the sewage farm. The crop selected was an average one. The outturn of canes, juice, syrup and sugar is shown below :—

Area.	Manure.	Crop.	Outturn per acre.						Remarks.
			Canes.	Juice obtained from canes.	Syrup (rab) obtained from juice.	Treacle obtained from syrup after separating the sugar.	Sugar obtained from the syrup.	Gur obtained from juice.	
Acres.			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	
0·50	Poudrette.	Sugar-cane.	11,172	6,550	1,244	† 882·5	* 120	....	* This was fine white sugar obtained by refining it thrice.
			1,588	1,008	...	...	...	174·25	† Out of the 882·5 lbs. of treacle, 328 lbs. were converted into gur, yielding 140 lbs. of nearly as good quality as the gur prepared from the juice direct.

The gur and the sugar were prepared by Hassu Khan who was sent for from Cawnpur by the Commissioner of Settlements and Agriculture, for the purpose of showing to the people of these Provinces how good gur and sugar can be made without much expenditure of fuel by the use of the megass. The gur that he made was far superior to any that is made in these parts, and the sugar made by him was quite good enough to be used for all purposes where fine Mauritius sugar is used.

22. A Statement is appended to this Report showing the actual cost to the Farm per acre of manures, seed and each of the various operations of cultivation, as calculated from the Account Book of the year. The rates must not be accepted as finally correct. A more accurate system of registering labour has lately been introduced, and this may show that some of the figures need alteration.

C.—Experiments with improved Agricultural Machinery.

23. The implements mentioned in previous Reports have continued to give satisfaction. Trials were made with sugar-cane mills and the results are shown below :—

	Cost at Nagpur.									Labour employed.	Quantity of canes crushed per hour.	Percentage of juice obtained.
	Price.			Freight.			Total.					
	Rs.	a.	p.	Rs.	a.	p	Rs.	a.	p.		lbs.	
Roger's Saharanpur steel sugar-cane mill ...	95	0	0	11	1	0	106	1	0	2 men and 2 bullocks	131	59
Bihia three-roller sugar-cane mill ...	128	0	0	18	2	0	146	2	0	do.	184	63
Bihia two-roller mill ...	50	0	0	25	15	0	75	15	0	do.	133	60

The Bihia three-roller mill would I think prove more useful in localities where the canes grown are very thick. Of the two others both are equally good and the higher cost of the Roger's mill is compensated for by the greater strength of the body, which is made entirely of iron.

24. The sale of improved implements, has I regret to say, made no progress.

D.—Agricultural training.

25. The work of the Agricultural Class continued to be satisfactory, though there were fewer new entries than in the previous year. The current year promises to show a great improvement in the latter respect. 17 students appeared for the final examination, of whom 14 passed. A separate report on the working of the class has already been submitted, from which the following quotations are made :—

More interest was shown this year by the students, specially the Senior students, in practical work than in the previous year. Soon after the commencement of the monsoon the Senior students began to sow their kharif crops. Juar and cotton were sown on 2·25 and 2·25 acres respectively. After the sowings were completed they prepared their plots for the rabi crops, weeding their kharif crops occasionally at intervals. The Junior students during this time were practising in ploughing and bakharing and were preparing their plots for the rabi crops. In October both the classes sowed gram and wheat in their plots. 1·25 acres were sown with gram by the Juniors and 2·25 acres by the Seniors. The area put down under wheat was 1·25 and 2·25 acres by the Junior and Senior students respectively. After the completion of the sowing of rabi crops most of the morning time was taken up with practical surveying and practical laboratory work, so that except holidays there was scarcely any day on which the students were not engaged in practical work of some kind or other, in the mornings. Permission to take the produce of their own fields has, I think, done more than any thing else to give them an interest in practical work. The value of the produce gathered during the year was only about Rs. 77, but the seasons were not favourable. Moreover owing to there being no fence round the students' plots the crops suffered much from the depredations of cattle in the night time, as the owners of the cattle living in the vicinity are in the habit of letting them loose in the night to graze as best they can. A Chowkidar was engaged to watch the crops, but trespasses were still far from uncommon. To make the students better acquainted with the work of the Experimental Farm it has been decided, at the suggestion of the Revenue and Agricultural Department of the Government of India, that in future they are to be required to keep a labour journal and cultivation book for the experiments conducted on the farm.

It is very satisfactory to note that some holidays were utilized by some of the students in going on excursions in the surrounding villages to take notes on agricultural matters. Every encouragement is given to the students to go on such excursions, as their advantages cannot be too highly valued.

The annual (Junior) and final (Senior) examinations were held in March 1890. The following gentlemen very kindly undertook to examine in the subjects mentioned against their names:—

Subjects.	Examiners.
Agriculture	J. B. Fuller, Esq., C. S., Commissioner of Settlements and Agriculture, Central Provinces.
Elementary	
Geology	Professor J. Bremner, M. A., (Hislop College.)
Chemistry	Dr. Alex. Robertson, M. B., (Hishop College.)
Practical Chemistry	
Botany	
Surveying	J. R. Scott, Esq., Assistant Settlement Officer, Nagpur.
Practical Surveying	
Drawing	Waman Rao Hardikar, Esq., Assistant Superintendent, Normal School, Nagpur.
Practical examination in Agriculture ...	Superintendent, Experimental Farm, Nagpur.

Eight Junior and 17 Senior students presented themselves for examination, of whom 7 of the former and 14 of the latter passed a satisfactory examination. The results may be summarized as below :—

Number of students obtaining marks.

	60 per cent and over.	40 per cent. and over.	20 per cent and over.	Below 20 per cent.
Senior Class	8	8	1	...
Junior Class	4	3	1	...

Of the 14 Senior students, 2 being matriculated have obtained first class, and the rest second class certificates. Mr. Fuller has very kindly presented a silver medal to Sorabji Bezonji who stands first on the list. All those who passed the final examination have been offered Government service as Revenue Inspectors if they qualify in practical work.

26. During the year a small cattle dispensary has been constructed in the vicinity of the Class Room for the practical treatment of cases. It is expected that there will be no lack of subjects.

The physical training of the students receives attention, and at the suggestion of the Inspector-General of Education some gymnastic appliances have been set up in the Class Room compound.

E.—Sewage Farm.

27. The irrigation water for the sewage farm is derived from percolation below the embankment of the Ambajhari reservoir and as the embankment consolidates with time the water supply decreases year by year. The supply of sewage has also been insufficient. This latter defect has now been remedied, but no means of increasing the water supply seem available. The area leased out to sewage tenants was 32 acres, the rent being Rs. 20, exclusive of water rate at 8 annas per watering per acre.

F.—Staff.

28. The Overseer of the Farm Mr. Hari Ramchandra Chakradeo has given entire satisfaction.

G.—Financial Results.

29. The expenditure and receipts of the farm are shown below. The expenditure includes the pay of the Superintendent, which was formerly charged to the Maharaj Bagh :—

	Expenditure.									Receipts.			Net cost.		
	Salaries.			Contingencies.			Total.								
	Rs.	a.	p.	Rs.	a.	p.	Rs.	a.	a.	Rs.	a.	p.	Rs.	a.	p.
Budget.	4,764	0	0	4,186	0	0	8,950	0	0	1,500	0	0	7,450	0	0
Actual..	4,586	6	11	4,046	6	2	8,632	13	1	1,831	1	6	6,801	11	7

30. The usual comparative record of experiments is appended.

I have the honor to be,

Sir,

Your most obedient Servant,

C. D. MAHALAXMIVALA,

Superintendent, Experimental Farm, Nagpur.

LIST OF ANNEXURES.

A.—Comparative Record of Experiments.

B.—Results of Cultivation on Non-experimental Area.

C.—Details of Total Area under Cultivation.

D.—Details of Rates used in calculating cost of Cultivation.

Prospectus of the Agricultural Class, Nagpur.

Annexure A.

Comparative Record of Experiments made on the Nagpur Experimental Farm, Central Provinces, during the year ending 31st March 1890.

Serial No.	Object of experiment.	No. of field.	Area of field.	Special treatment.	Outturn per acre. Grain or lint.	Outturn per acre. Straw or seed.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Grain or lint.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Straw or seed.	Cost per acre. Manure or special treatment.	Cost per acre. Total cost of cultivation, exclusive of manure or special treatment.	Value of produce.
			Acres.		lbs.	lbs.			Rs. a. p.	Rs. a. p.	Rs. a. p.
				(a) *Cotton (Upland Georgian.)*							
1	To test the comparative effect of dung and bone-dust.	18E.	0·44	Dung, 160 maunds per acre ...	101	285	+28	+27	10 0 0	21 15 6	28 10 6
		18W.	0·44	Bone-dust, 360 lbs. ...	79	224	...	...	3 6 0	21 15 6	22 6 11
2	Ditto ...	39N.	0·37	Bone-dust 360 lbs. per acre ...	84	218	...	...	3 6 0	18 12 3	23 9 0
		39S.	0·21	Dung, 160 maunds ...	175	474	+108	+117	10 0 0	19 4 8	49 5 11
3	To test the comparative effect of dung, bone-dust and hemp.	17	0·49	Dung, 160 maunds per acre ...	144	379	+55	+49	10 0 0	13 13 3	40 7 6
		21	0·76	Previous year's green soiling ...	121	315	+30	+24	...	13 14 0	33 15 4
		25	0·48	Bone-dust, 360 lbs. per acre ...	93	254	...	...	3 6 0	14 12 1	26 4 4
4	To test the comparative effect of dung, bone-dust and poudrette.	53	1·61	*Nil.* ...	63	163	...	...	...	16 13 6	17 10 8
		55	1·53	Dung, 160 maunds per acre ...	112	288	+78	+77	10 0 0	14 15 1	31 6 1
		57	1·25	Bone-dust, 360 lbs. ...	68	187	+8	+15	3 6 0	13 11 10	19 3 7
		59E.	0·85	Poudrette, 200 maunds ..	86	230	+37	+41	5 0 0	16 3 5	24 3 7
		59W.	0·85	Previous year's poudrette ...	80	212	+27	+30	...	16 3 5	22 8 1
5	To test the effect of previous year's green soiling.	61	1·05	Previous year's green soiling ...	101	256	No comparative trial made with unmanured land.			21 6 7	28 3 11
		63	1·02	Ditto ...	82·5	232				22 7 8	23 6 4
		65	0·93	Ditto ...	66	190				22 0 9	18 13 10

Annexure A.—(Contd.)

Serial No.	Object of experiment.	No. of field.	Area of field.	Special treatment.	Outturn per acre. Grain or lint.	Outturn per acre. Straw or seed.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Grain or lint.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Straw or seed.	Cost per acre. Manure or special treatment.	Cost per acre. Total cost of cultivation, exclusive of manure or special treatment.	Value of produce.
			Acres.	*(a) Cotton, Upland Georgian (contd).*	lbs.	lbs			Rs. a. p.	Rs. a. p.	Rs. a. p.
6	To test the effect of preparing cotton seed with acid against country method ...	61E.	0·52	Seed prepared by the country method ...	·89	202	...	...	0 1 0	21 5 7	24 8 11
		61W.	0·53	Seed prepared with acid ...	113	310	+27	+53	0 12 0	21 5 7	31 15 0
7	Do. ...	63E.	0·51	Seed prepared by the country method ...	65	191	...	...	0 1 0	22 6 8	18 8 9
		63W.	0·51	Sed prepared with acid ...	100	273	+54	+43	0 12 0	22 6 8	28 3 11
8	To test the residual effect of poudrette.	40	0·30	*Nil* ...	141	397	No comparative trial made.			18 9 4	39 15 10
				(b) Cotton, Hinganghat Bani.							
9	To test the average yield ...	Irri. 2	0·10	Dung, 160 maunds per acre ...	160	435	...	...	10 0 0	14 5 2	45 2 7
				(c) Sorgho.	Syrup. lbs.	Sugar. Oz.					
10	To test the effect of dung and bone-dust.	67E. E.	0·32	Dung, 160 maunds per acre ...	274	7·5	+15	...	10 0 0	6 11 0	5 15 11
		67E. W	0·37	*Nil* ...	237	6·5	...	...	...	6 8 1	5 2 11
		69W.	0·29	Bone-dust, 360 lbs. ..	147	8·5	+18	...	3 6 0	8 8 9	3 3 5
		9E.	0·30	*Nil* ...	124	2·5	...	...	...	8 7 0	2 11 4

			Area.								
				(d) Til.							
11	Permanent Manure Experimental plots, Second series.	B.I	0·10	Saltpetre, 240 lbs. per acre ...	397	900	+41	+23	30 0 0	10 5 0	24 4 11
		B.II	0·10	Bone-dust, 360 lbs. „ ..	275	800	—2	+10	3 6 0	10 5 0	17 4 5
		B.III	0·10	Saltpetre, 240 lbs. and bone-dust, 360 lbs. „	490	1,250	+74	+71	33 6 0	10 5 0	30 5 7
		BIV.	0·10	Cattle dung, 160 maunds „ ..	407	710	+44	—3	10 0 0	10 5 0	24 6 2
		B.V	0·10	Dung 160 maunds, and bone-dust, 360 lbs. „	290	720	+3	—1	13 6 0	10 5 0	17 14 7
		B.VI	0·10	Ashes of 160 maunds dung „ ...	245	760	—13	+4	12 8 0	10 5 0	15 8 2
		B.VII	0·10	*Nil* ...	282	730	...	...	...	10 5 0	15 10 8
		B.VIII	0·10	Crop of hemp ploughed in green.	202	670	—28	—4	9 10 0	10 5 0	12 14 5
				(e) Linseed.							
12	To test the effect of embanking.	34	1·22	Embanked.	188	391	No comparative trial			10 12 6	10 6 1
13	To test the effect of hemp and bone-dust.	46	1·10	Hemp ploughed in green ...	208	452	+7	+22	9 10 0	6 15 6	11 8 6
		47	1·44	Bone-dust, 360 lbs. per acre ...	195	371	...	...	3 6 0	6 14 11	10 10 10
14	To test the comparative effect of dung, bone-dust and hemp.	22	1·19	Hemp ploughed in green ...	421	566	+54	+7	9 10 0	11 12 10	22 7 6
		23E.	0·69	Bone-dust, 360 lbs. per acre ...	322	584	18	+11	3 6 0	15 0 2	17 8 11
		23W.	0·69	*Nil* ...	310	579	...	...	...	15 0 2	16 15 2
		26S.	0·87	Dung, 160 maunds - ...	273	528	...	...	10 0 0	14 6 2	14 15 6
				(f) Wheat, haura.							
15	Permanent Manure Experimental plots, First series.	A.I	0·10	Saltpetre, 240 lbs. per acre ...	987	1,347	+11	—13	30 0 0	14 13 6	31 4 5
		A.II	0·10	Bone-dust 360 lbs. „ ...	845	1,240	—5	—20	3 6 0	14 13 6	26 15 10
		A.III	0·10	Saltpetre 240 lbs, and bone dust 360 lbs. „	1,127	1,672	+27	+7	33 6 0	14 13 6	36 0 8
		A.IV	0·10	Cattle dung, 160 maunds „ ...	1,012	1,720	+14	+10	10 0 0	14 13 6	32 14 7
		A.V	0·10	Cattle dung, 160 maunds, and bone dust, 360 lbs. „	967	1,715	+9	+10	13 6 0	14 13 6	31 10 0
		A.VI	0·10	Ashes of 160 maunds dung „ ...	1,110	1,632	+25	+4	12 8 0	14 13 6	35 7 6
		A.VII	0·10	*Nil* ...	887	1,557	...	...	...	14 13 6	28 15 6
		A.VIII	0·10	Hemp, ploughed in green ...	767	1,415	—14	—9	9 10 0	14 13 6	25 3 6

Annexure A.—(Contd).

Serial No.	Object of experiment.	No. of field.	Area of field.	Special treatment.	Outturn per acre. Grain or lint.	Outturn per acre. Straw or seed.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Grain or lint.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Straw or seed.	Cost per acre. Manure or special treatment.	Cost per acre. Total cost of cultivation, exclusive of manure or special treatment.	Value of produce.
			Acres.	(f) *Wheat, haura—(Contd.)*	lbs.	lbs.			Rs. a. p	Rs a. p.	Rs. a. p.
16	Permanent Manure Experimental plots, Third series ...	C. I	0·10	Saltpetre, 240 lbs. per acre ...	772	1,077	+12	—3	30 0 0	14 13 6	24 8 4
		C. II	0·10	Bone-dust, 360 lbs. „ ..	752	1,147	+9	+3	3 6 0	14 13 6	24 2 1
		C. III	0·10	Saltpetre, 240 lbs. and bone-dust 360 lbs „ ...	747	1,325	+9	+19	33 6 0	14 13 6	24 6 11
		C. IV	0·10	Cattle dung, 160 maunds „ ...	512	820	—25	—26	10 0 0	14 13 6	16 8 5
		C. V	0·10	Cattle dung, 160 maunds and bone-dust 360 lbs „ ...	817	1,397	+19	+26	13 6 0	14 13 6	26 9 6
		C. VI	0·10	Ashes of 160 maunds dung „ ...	767	1,007	+12	— 9	12 8 0	14 13 6	24 3 2
		C. VII	0·10	*Nil.*	687	1,112	...	...	...	14 13 6	22 3 3
		C. VIII	0·10	Hemp ploughed in green ...	582	970	—15	—13	9 10 0	14 13 6	18 14 1
17	Practical soil analysis on Ville system ...	Ville I	0·05	As in VI, less calcic sulphate ..	1,450	2,390	+42	+19	The experiment has no bearing on profit or loss.		46 15 6
		Do. II	0·05	As in VI, less potassic sulphate ..	1,405	2,255	+38	+13			45 5 9
		Do. III	0·05	No manure ...	1,020	2,000	...	...			33 13 5
		Do. IV	0·05	As in VI, less ammonic chloride...	1,120	2,240	+10	+12			37 4 3
		Do. V	0·05	As in VI, less calcic superphosphate ...	1,325	2,075	+30	+4			42 10 5
		do. VI	0·05	Ammonic chloride, 140 lbs per acre; Calcic superphosphate, 180 lbs. „; Potassic sulphate, 90 lbs. „; Calcic sulphate, 100 lbs. „	1,155	1,470	+13	+26			36 5 3
18	To test the time for applying dung to embanked fields.	41	1·22	Dung, 160 maunds per acre (before rains).	258	546	...	...	10 0 0	9 6 9	8 10 6
		42	1·23	Do. (after rains) ..	265	421	3	—22	10 0 0	11 10 2	8 8 9

19	To test the time for applying dung to embanked fields.	43	1·30	Dung, 160 maunds per acre (after rains.)	262	508	—8	+17	10 0 0	8 6 7	8 10 9
		44	1·22	Do. (before rains).	284	434	...	...	10 0 0	11 6 7	9 1 10
20	To test the effect of green soiling with hemp.	14E	0·51	Hemp ploughed in green ...	437	845	—1	+3	9 10 0	12 14 8	14 7 5
		14W	0·51	*Nil.* ...	443	818	...	...	...	12 14 8	14 9 2
21	As above ...	15	0·54	Hemp ploughed in green ...	414	897	+192	+219	9 10 0	12 13 6	13 15 1
		19	0·56	*Nil.* ...	142	281	...	...	...	15 13 7	4 11 4
22	As above ...	37	0·89	Hemp ploughed in green ...	265	512	No comparative trial.		9 10 0	12 5 2	8 10 10
23	To test the effect of gypsum	60W	1·15	Gypsum, 480 lbs. per acre ...	235	509	—4	+6	7 3 3	15 1 7	7 14 8
		60 E	1·15	*Nil.* ...	245	478	...	...	...	14 14 1	8 1 11
24	To test the effect of saltpetre in embanked fields.	62E	0·81	Saltpetre, 240 lbs. per acre ...	246	543	+97	+80	30 0 0	17 1 10	8 5 0
		62W	0·81	*Nil.* ...	125	301	...	...	...	17 1 10	4 4 7
25	To test the comparative effect of dung and bone-dust.	29	0·82	Dung, 160 maunds per acre ...	981	1,276	+63	+32	10 0 0	16 2 8	30 14 9
		33E	0·37	*Nil.* ...	599	969	...	...	...	16 8 10	18 7 5
		33W	0·37	Bone-dust, 360 lbs. „ ..	639	1,061	+7	+9	3 6 0	13 4 5	20 11 6
		36	0·55	*Nil.* ...	719	1,156	...	...	...	17 4 4	23 3 5
26	To test the effect of embanking.	2	1·45	*Nil.* ..	92	281	No comparative trial.			12 0 10	3 4 9
					(g) *Wheat (pissi.)*						
27	To test the effect of green soiling with hemp.	38N	0·15	Hemp ploughed in green ...	538	922	—1	+1	9 10 0	13 14 9	17 0 7
		38S	0·15	*Nil.* ...	541	912	...	...	...	13 14 9	17 1 6

Annexure A.—(Contd).

Serial No.	Object of experiment.	No. of field.	Area of field.	Special treatment.	Outturn per acre. Grain or lint.	Outturn per acre. Straw or seed.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Grain or lint.	Percentage of increase (+) or decrease (—) in produce resulting from experimental treatment. Straw or seed.	Cost per acre. Manure or special treatment.	Cost per acre. Total cost of cultivation, exclusive of manure or special treatment.	Value of produce.
				(g.) *Wheat (pissi.)* Contd.	lbs.	lbs.			Rs. a. p.	Rs. a. p.	Rs. a. p.
		Acres.									
28	To test the effect of saltpetre in embanked fields.	64 W	0·63	Saltpetre, 240 lbs. per acre ...	232	581	+92	+71	30 0 0	14 14 0	7 12 10
		64 E	0·63	*Nil* ...	121	348	...	...	...	14 14 0	4 2 11
29	To test the effect of gypsum ...	13	0·18	Gypsum, 480 lbs. per acre ...	125	442	No comparative trial made.		7 3 3	14 6 1	4 8 5
				(h.) *Wheat (katha).*							
30	To test the effect of bone-dust ...	12 S.S.	0·29	Bone-dust, 360 lbs. per acre ...	383	690	+27	+38	3 6 0	14 12 0	12 6 1
		12 S N.	0·28	*Nil*	302	498	...	...	...	14 1 0	8 15 10
31	To test the effect of embanking.	45	1·21	Embanked ...	272	490	No comparative trial made.		...	14 12 10	8 8 1
				(i.) *Pedigree wheat.*							
32	To improve the seed ...	1 (part)	0·09	Bone-dust, 360 lbs. per acre with 3 irrigations.	*Wheat, haura.* 2,272	6,378	...	...	18 2 0	26 9 10	82 3 4
	Ditto	Do.	0·09	Ditto	*Wheat, pissi.* 1,983	5,700	...	...	18 2 0	26 11 11	70 14 6
	Ditto	Do.	0·09	Ditto	*Wheat, katha.* 1,844	5,444	...	...	18 2 0	26 12 2	64 1 7

Annexure B.

Results of Cultivation of the Non-experimental Area of the Nagpur Farm during the year 1889-90.

No. of field.	Area of field.	Outturn per acre.		Cost of cultivation.	Value of produce.
		Grain.	Straw.		
	Acres.	lbs.	lbs.	Rs. a. p.	Rs. a. p
		(A).—Juar for grain.			
48 ...	2·75	591	2,540	7 12 10	23 4 4
68 ...	0·54	490	4,661	18 1 1	32 9 9
		(B).—Juar for fodder.			
4 ...	0·86	...	3,376	6 13 0	17 9 4
7 ...	0·57	...	5,553	5 5 1	28 14 9
16 ...	0·65	...	5,938	6 0 8	30 14 10
20 ...	0·42	...	5,286	6 1 0	27 8 6
24 ...	0·93	...	5,595	7 3 2	29 2 3
61 ...	1·53	...	2,233	5 13 3	11 10 1
		(C).—Guinea grass.			
1A ...	0·18	...	4,589	2 12 0	21 8 2
12 N ...	0·56	...	429	1 0 0	2 0 2
67 W ...	0·75	...	413	1 0 0	1 15 0
		(D).—Tur.			
3 ...	0·87	447	...	7 7 2	10 5 8
5 ...	0·81	808	...	9 4 3	18 11 6
27 ...	0·42	900	...	7 6 8	20 13 8
31 ...	0·32	1,148	...	14 10 11	26 9 7
54 ...	1·05	679	...	17 4 2	15 11 9
66 ...	1·12	641	...	16 0 7	14 13 8
17 A and B...	0·29	524	...	6 15 9	12 2 3
21 A ...	0·24	525	...	6 10 11	12 2 8
25 A and B ...	0·25	592	...	7 1 0	13 11 5
33 A ...	0·04	81	...	8 11 7	1 14 0
36 A ...	0·09	267	...	9 5 1	6 3 0
72 ...	0·76	954	...	16 13 2	22 1 8

Annexure B.—(Contd).

No. of field.	Area of field.	Outturn per acre.		Cost of cultivation.	Value of produce.
		Grain.	Straw.		
	Acres.	lbs.	lbs.	Rs. a. p.	Rs. a p.
		(E).—Moong.			
28 ...	0·13	223	...	14 4 4	5 9 2
		(F).—Urd.			
58 ..	1·06	33	...	12 6 0	0 15 10
		(G).—Popat.			
52 ...	2·08	184	...	11 1 6	3 4 6
		(H).—Japan peas.			
10 ...	0·55	87	...	17 14 6	Not sold.
		(I).—Country peas.			
1 (part) ...	0·08	1,391	...	12 9 0	31 9 10
		(J).—Til.			
32 .	0·67	228	...	9 12 6	12 10 8
		(K).—Castor.			
56 ...	1·20	328	...	12 4 8	12 0 1
		(L).—Chillies.			
1 (part) ...	0·07	86	...	20 7 5	10 12 0
		(M).—Linseed.			
1 (part) ...	0·06	383	767	6 5 5	21 1 1
8 ...	1·30	139	270	23 15 11	7 10 0
30 ..	1·13	308	493	11 0 6	16 10 2
6 ...	0·92	271	431	12 10 2	14 10 1
		(N).—Gram.			
11 ...	0·92	442	...	13 7 6	11 15 2
10 ...	0·55	307	...	5 12 9	8 4 9
49 ...	2·42	88	...	9 11 6	2 6 1
50 ...	2·22	85	...	8 11 2	2 4 9
		(O).—Wheat (haura.)			
9 ...	0·98	291	679	21 6 4	9 14 8
C. Mis. ...	0·10	540	1,000	17 5 6	17 12 3
		(P).—Wheat (katha.)			
35 ...	0·24	594	1,006	15 9 8	18 6 9

Annexure C.

Total Area under Cultivation on the Nagpur Experimental Farm during the year 1889-90.

Kharif.	Acres.	Rabi.	Acres.
	Experimental area.		
Cotton (Upland Georgian)	12·58	Wheat (ordinary)	20·88
Do. (Hinganghat Bani)	0·10	Do. (pedigree)	0·27
Do. (Sea Island)	0·08	Linseed	7·20
Sorgho	1·33	Sugar-cane	0·13
Til	0·80	Total Rabi ...	28·48
Total Kharif ...	14·89	Grand Total (Experimental area) ...	43·37
	Non-experimental area.		
Juar	8·25	Wheat	1·32
Guinea grass	1·49	Linseed	3·41
Tur	6·26	Gram	6·11
Mung	0·13		
Urd	1·06	Total Rabi ...	10·84
Popat (white)	2·08		
Japan pea	0·55		
Country pea	0·08		
Til	0·67		
Castor	1·20		
Chillies	0·07		
Total Kharif ...	21·84	Grand Total (Non-experimental area) ...	32·68

Annexure D.

Statement showing the rates used for calculating cost of Cultivation.

[NOTE—The hire of a pair of bullocks is taken as 12 annas, of a male cooly 3 annas, of a female cooly 1½ annas and of a child 1 anna.]

Class of operation.	Detail.	Rate per acre. Rs.	a.	p.	Explanation.
Cultivation ...	Ploughing ...	1	12	0	A pair of bullocks and a man for 1·86 days.
	Bullock hoeing (bakhering)..	1	0	0	As above for 1·06 days.
	Weed hoeing by daura ..	0	12	0	A pair of bullocks and 2 men for 0·66 day.
	Weed hoeing by dundia ...	0	9	0	As above for 0·50 day.
	Weeding by hand ..	2	12	0	30 women for ·98 day.
Sowing, including cost of seed.	Cotton ...	1	1	0	12 lbs. of seed. A pair of bullocks and a man and 3 women for 0·25 day.
	Juar ...	0	12	9	15 lbs. of seed. A pair of bullocks and 2 men for 0·5 day.
	Tur ..	0	12	0	10 lbs. of seed. A pair of bullocks and 2 men for 0·38 day.
	Til ...	0	9	6	1½ lbs. of seed. A pair of bullocks and 2 men for 0·44 day.
	Moong ...	0	9	0	6 lbs. of seed. As above for 0·33 day.
	Urd	0	9	6	7 lbs. of seed. As above for 0·33 day.
	Popat ...	0	14	0	12 lbs. of seed. A pair of bullocks, one man and 3 women for 0·41 day.
	Peas ...	1	4	0	28 lbs. of seed. 2 pairs of bullocks and 3 men for 0·18 day.
	Castor ...	1	11	6	15 lbs. of seed. A pair of bullocks and 2 men for 1·11 days.
	Linseed ...	1	13	0	15 lbs. of seed. 2 pairs of bullocks and 3 men for 0·42 day.
	Gram ...	1	12	6	25 lbs. of seed. As above for 0·48 day.
	Wheat ...	3	4	0	60 lbs. of seed. As above for 0·66 day.
	Hemp ...	1	10	3	100 lbs. of seed. One man for ·22 day.
Manuring ...	Cattle dung ...	10	0	0	160 maunds at one anna per maund of 80 lbs.
	Bone-dust ...	3	6	0	360 lbs. Cost of collecting 8 annas per maund and of crushing 4 annas per maund.
	Ashes of dung ...	12	8	0	Ashes of 160 maunds dung at Re. 0-1-3 per maund of 80 lbs.
	Saltpetre ...	30	0	0	240 lbs. at Rs. 10 per maund.
	Gypsum ...	7	3	3	480 lbs. at Re. 1-3-3 per maund.
	Ammonic chloride ...	39	6	0	140 lbs. at Rs. 22-8-0 per maund.
	Potassic sulphate ...	33	12	0	90 lbs. at Rs. 30 per maund.
	Calcic superphosphate ...	45	0	0	180 lbs. at Rs. 20 per maund.
	Hemp ploughed in green ...	9	10	0	100 lbs. seed Re. 1-9-7, sowing Re. 0-0-8, cutting and ploughing Rs. 7-15-9.
Harvesting ...	Picking cotton ...	0	6	0	4 women for a day.
	Reaping juar ...	0	12	0	8 do. do.
	Do. tur ...	0	6	0	4 do. do.
	Do. til ...	0	10	0	6 do. do.
	Do. gram ...	0	12	0	8 do. do.
	Do. linseed ...	0	8	0	5 do. do.
	Do. wheat ...	0	5	0	3 do. do.
Cleaning ...	Cotton ginning ...	2	8	0	27 women for ·99 day at an average produce per acre for the year of 312 lbs. seed cotton.
	Threshing and cleaning juar.	2	0	0	2 do. and 4 bullocks for 1·06 days.
	Do. tur ...	3	0	0	7 do. for 2·28 days.
	Do. gram ...	1	8	0	4 do. for 2 days.
	Do. linseed ...	1	0	0	6 do. for 0·88 day.
	Do. wheat ...	2	8	0	2 bullocks, 6 men and 4 women for 0·11 day.
	Do. til ...	0	8	0	3 men for 0·88 day.

PROSPECTUS OF THE AGRICULTURAL CLASS, NAGPUR.

The Agricultural Class, Nagpur, was opened on June 1st, 1888, in connection with the scheme for Technical Education, laid down in Chief Commissioner's Minute, dated 28th April 1888.

2. The class building and fields for practical instruction in agriculture are situated on land forming a part of the Government Experimental Farm, which is also made available for practical instruction in agriculture.

3. The class though placed under the Educational Department is directly under the control of the Commissioner of Settlements and Agriculture, Central Provinces. The staff consists of a Principal and two Assistants.

NOTE —The staff in June 1890 was as follows :—

Principal.

C D Mahaluxmivala, Superintendent, Experimental Farm, Nagpur

Lecturer on Agriculture and Surveying.

R S. Joshi (Agricultural Branch, College of Science, Poona)

Lecturer on Veterinary and Superintendent Veterinary Dispensary.

K. P. Dewasthale (Veterinary College, Bombay)

4. The new classes are formed annually on June 1st.

5. Candidates for admission to the class must have passed the Middle School or the Matriculation Examination, preference being given to the latter. No candidate will be allowed to join who is physically unfit for practical work or (unless admitted for special reasons) who is under 16 years or over 21 years of age.

6. Applications for admission must be submitted in writing to the Principal before June 1st, stating qualifications.

7. No fee is charged to the students for receiving instruction in the class.

8. There are no special scholarships for the class, but the scholarships granted by the Educational Department are tenable at the class.

9. Students who are not residents of Nagpur are given free quarters, but they must make their own arrangements for their board.

10. The course of study occupies two years with a long vacation each year from 1st April to 31st May. Attendance at lectures, in the laboratory, and at practical work in the fields, is necessary. Irregularity of attendance disqualifies a student for appearing at the examination.

11. The course of study comprises—

Agriculture (theory and practice).
Surveying (do.)
Chemistry (theoretical and practical).
Botany.
Geology.
Elementary Veterinary (practice and science.)
Drawing.

12. The following are the text books appointed:—

Agriculture—First Principles of Agriculture—Tanner.
Elementary Lessons in do. do.
Agricultural Primer —Fuller.
Chemistry—Science Primer—Roscoe.
Geology— do. do. —Geikie.
Manual of Geology for Indian students—Cooke.
Botany—Science Primer—Hooker.

13. To ensure that the students acquire a practical knowledge of agriculture, plots of land are allotted to them which they are required to cultivate with their own hands. They are permitted to keep the produce. The students also maintain a labour journal and cultivation book for the experiments conducted on the Experimental Farm.

14. The course of instruction in surveying largely consists of practical work with the plane table, chain and theodolite.

15. A small veterinary dispensary is attached to the class for practical instruction in the treatment of the more common forms of cattle disease.

16. A preliminary examination is held in March at the end of the first year's course, to qualify for admission to the second year's course. Students who fail at the preliminary examination may be allowed for special reasons to remain in the class, but must recommence the first year's course.

17. A final examination is held in March at the end of the second year's course, and Certificates are given to those who pass this examination; matriculated students being given First Class Certificates, and others Second Class Certificates.

18. Conduct tickets are given to students every fortnight, and Good Conduct Cards are given annually to students who have satisfied the teachers with their conduct.

19. Any student found incapable through laziness or otherwise to keep up with the lectures and practical work, is liable to be dismissed any time at the discretion of the Principal.

20. Students who obtain certificates will be considered to have a preferential claim for appointments in the subordinate Revenue, Settlement and Court of Wards' establishments.